

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

04 OCT 2004

Applicant's or agent's file reference RJW:MC:FP17593	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. <b>PCT/AU2003/000409</b>	International Filing Date (day/month/year) 4 April 2003	Priority Date (day/month/year) 5 April 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. <sup>7</sup> G06K 9/00, G06F 19/00		
Applicant COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 30 October 2003	Date of completion of the report 21 January 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>DALE SIVER</b> Telephone No. (02) 6283 2196

**I. Basis of the report****1. With regard to the elements of the international application:\***☒ the international application as originally filed.☐ the description, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of☐ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages , received on with the letter of☐ the drawings, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished**4. ☐ The amendments have resulted in the cancellation of:**☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/fig.**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims 1-11	YES
	Claims	NO
Inventive step (IS)	Claims 1-11	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-11	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

- D1 STEIN et al. "Anomaly detection from hyperspectral imagery" IEEE Signal Processing Magazine January 2002  
D2 SHAW et al. "Signal processing for hyperspectral image exploitation" IEEE January 2002  
D3 US 6208752 B (PALMADESSO et al.) 27 March 2001  
D4 WINTER M. "N-FINDR: an algorithm for fast autonomous spectral end-member determination in hyperspectral data" SPIE Vol. 3753 1999  
D5 NEVILLE et al. "AUTOMATIC ENDMEMBER EXTRACTION FROM HYPERSPECTRAL DATA FOR MINERAL EXPLORATION" 4th Airborne Remote Sensing Conference and Exhibition 21-24 June 1999  
D6 WO 98/02842 A (THE GOVERNMENT OF THE UNITED STATES OF AMERICA as represented by THE SECRETARY OF THE NAVY) 22 January 1998

**Novelty (N)**

None of the citations explicitly disclose each and every integer of claim 1, therefore the claim is novel. Accordingly all the claims satisfy PCT requirements for novelty.

**Inventive step (IS)**

The method of claim 1 for identifying endmember spectra values from multispectral images, where each value is equal to a sum of mixing proportions of each endmember spectrum includes steps a) processing to obtain a simplex having vertices, b) providing starting estimates, c) estimating mixing proportions, d) estimating spectrum of each endmember using mixing proportions, e) repeating steps until relative change in the regularised residual sum of squares converges and f) including in step e) a measure of the size of the simplex.

The documents D1 to D6 are directed at identifying endmember spectra values from multispectral or hyperspectral images. D3 and D6 disclose using the "Shrink Wrap minimization" algorithm to solve the endmember problem. The SERENE technique explicitly selects the largest residual by performing an autocorrelation and given the candidate exceeds a threshold, initiates the shrink wrap process. Using the residual data to guide the shrink wrap process is not equivalent to minimising a linear combination of the residual sum of squares and a measure of the size of the simplex.

It would not be obvious to repeat steps (c) and (d) until the relative change in the regularised residual sum of squares is sufficiently small. The regularised residual sum of squares including a term which is a measure of the size of the simplex. Therefore the claims satisfy PCT inventive step requirements in light of the above documents and any obvious combination of these documents.